Papéis Avulsos de Zoologia

Museu de Zoologia da Universidade de São Paulo

Volume 43(8):145-159, 2003 **www.scielo.br/paz.htm** **ISSN 0031-1049**

FURTHER REVISIONARY STUDIES ON THE ANT GENUS *MEGALOMYRMEX* FOREL (HYMENOPTERA: FORMICIDAE: MYRMICINAE: SOLENOPSIDINI)

CARLOS ROBERTO F. BRANDÃO[1]

ABSTRACT

I hereby revise, for the second time, the primarily Neotropical solenopsidine ant genus Megalomyrmex*, describing* M. wettereri *n. sp., of the Silvestrii group, based on workers and gynes.* Megalomyrmex latreillei *Forel is synonymyzed under* M. foreli *Emery. The gyne of* M. poatan *is described and that of* M. wallacei *redescribed; males of* M. acauna, M. incisus *and* M. wallacei *are described. New locality records are given for* M. ayri, M. cupecuara, M. goeldii, M. iheringi, M. modestus, *and* M. wallacei *(Modestus group);* M. acauna, M. balzani, M. cyendyra, M. emeryi, M. foreli, M. glaesarius, M. leoninus, M. staudingeri, *and* M. timbira *(Leoninus group)*; M. poatan, M. silvestrii, *and* M. symmetochus *(Silvestrii group), and* M. drift, M. incisus, M. myops *and* M. pusillus *(Incisus group). New biological data are recorded for* M. acauna, M. goeldii, *and* M. wallacei. *Comments are made for* M. bidentatus, M. miri *and* M. mondabora.

KEYWORDS: Hymenoptera, Formicidae, Myrmicinae, *Megalomyrmex*, taxonomy, biology.

INTRODUCTION

The 31 valid species of the ant genus *Megalomyrmex* are restricted to the wet and subtropical forests of South and Central America (Brandão, 1990). Since the publication of my revision of the genus (*op. cit.*), material from critical areas has accumulated in the collection of the Museu de Zoologia, Universidade de São Paulo (MZSP) and others that, combined with new information on the biology of some species, make it possible to resolve some issues left open, including the description of a new species, and castes of known species. Samples loaned from the Los Angeles County Museum (Roy R. Snelling – curator), the Instituto Humboldt (Bogotá, Fernando Fernández – curator), the CPDC – Centro de Pesquisas do Cacau, (Itabuna, BA, Brazil, Dr. Jacques Delabie, curator) and those kindly gifted or loaned to the Museu de Zoologia da Universidade de São Paulo by several colleagues are important new sources of material. Also, recent trips by the MZSP team mostly to the Brazilian central Plateau, the semi-arid Northeastern Brazil, and the Atlantic Forest, helped to enrich our holdings and/or to improve the knowledge on the biology of these by no means rare, although seldom collected ants.

MATERIAL AND METHODS

In the present paper, I follow the format and order employed in the last revision (Brandão, 1990) to facilitate consultation, including the acronyms adopted

[1] Museu de Zoologia da Universidade de São Paulo – Av. Nazaré, 481 – CEP 04263-000, São Paulo, SP, Brasil. E-mail: crfbrand@usp.br

for museum collections. Collections newly studied are: LACM – Los Angeles County Museum of Natural History (Roy R. Snelling, curator), IHVL – Instituto Humboldt, Villa de Leiva, Bogotá (Fernando Fernández C., curator), INBC – Instituto Nacional de Biodiversdidad (INBIO on labels), Costa Rica (Jack Longino, curator), and CPDC – Centro de Pesquisas do Cacau, Comissão Executiva do Plano de Lavoura Cacaueira (CEPLAC), C.P. 7, Itabuna, BA, 45600 (Jacques Delabie, curator). Acronyms for collections follow Brandão (2000).

For localities not cited in the previous revision, I provide available coordinates from the NIS Gazetteer (1955-1974). Where coordinates were provided in the labels, I simply copied them adding comments or corrections when necessary. I have tried to write in full some abbreviations used by collectors whenever necessary, recording these additions inside parenthesis. Label notes I was not able to interpret are copied inside brackets.

Unless otherwise stated, all studied specimens are deposited in the Museu de Zoologia da Universidade de São Paulo. Following also what has been done in the first revision (Brandão, *op. cit.*), I divided large series and redistributed specimens among collections to allow an efficient dispersal of duplicates. If the final destination of a given sample is not the MZSP, I acknowledge it under each species subheading.

I adopt also the terminology employed in Brandão (1990), but should correct the terms mesosternum and metasternum paired acrotergites to mesosternum and metasternum paired acrosternites, respectively.

The SEM images were made with a Leica 360 microscopy, after coating with gold.

RESULTS

The increasing use by myrmecologists of new collecting techniques for surveying the ant fauna in several localities of the Neotropics has been fruitful in the case of *Megalomyrmex*. In particular, rarely collected species, mainly the relatively small ones, have been recovered by submitting forest leaf litter samples either to Berlese-Tülgrem funnels or Winkler extractors, by attracting them to ground sardine baits, or recovering ants from sifted litter (see Brandão *et al.* 1999). It is interesting to note that even with significant sampling efforts in different habitats, all *Megalomyrmex* were collected only in wet and subtropical forests; it is also worthwhile to note that *Megalomyrmex* has never been collected from canopies using insecticide fogging techniques (Wilson, 1987), further indicating that *Megalomyrmex* are ground living ants that only inhabit the litter of wet and subtropical forests in the Neotropics.

The *Megalomyrmex* species groups adopted previously (Brandão, 1990) are followed here, as they proved to be useful in keying out the species sharing important biological and morphological traits.

The Modestus and Leoninus groups were separated from members of the other two groups in the 1990 key as having dental formula 1 + 4 and palp formula 4:3 in the worker caste (see Brandão, 1990, figs 9-16; 49-59). It should be added that in both groups the preapical teeth show virtually identical development and the cutting blades of the mandibles lack a diastema. Some species of the other groups may have similar denticle counts but in this case the subapical teeth are unequal and often separated by a diastema.

Modestus group

Jones *et al.* (1999) presented a table comparing the venom alkaloids in two species (*M. modestus* and *M. goeldii*) belonging to this group. New information regarding the species in this group follows.

Megalomyrmex ayri Brandão, 1990

Dr. Heraldo Vasconcellos collected two workers of *Megalomyrmex ayri* at Km 72, BR 174, Manaus, Amazonas state, Brazil (03°08'S, 60°01'W), in March 1990 (# 4642). A.B. Casimiro collected a worker and a gyne of *M. ayri* also in Manaus (# 4832 – Rs 2108 – E3). These are the first records of the species in Central Amazon, and the first records after the description of the species by Brandão (1990). Regarding the Modestus species group, only *M. wallacei* was previously recorded in the Amazonian basin. *Megalomyrmex ayri* appears to be uncommon in Manaus, as this locality has been intensively collected in recent years by several colleagues, and only these two samples have turned up thus far.

J. Delabie (CEPLAC, Itabuna, Bahia state, Brazil) sent me for study material collected in three localities in eastern Bahia state, Brazil: 3 alate gynes and a worker (# 4733) in Cachoeira, collected by G. Santos, in December 11, 1993, a worker from Ubatã (14°13'32"S, 39°27'56"W), collected by J.C.S. Carmo in December 27, 1996, and a worker from Ilhéus

(# 4544B), collected by A.B. Casimiro in August 25, 1992. Workers of these three samples fit the definition of *M. ayri* since they show a clear suture between anepisternun and katepisternun. However, the Cachoeira gynes are problematically assigned as they present smooth mandibles. Also all other *M. ayri* samples come from Amazonian localities. For this reason, it is preferable to wait for more Bahian material before applying a name to these samples.

Megalomyrmex cupecuara Brandão, 1990

I considered the first funicular segment twice as large as the second, one of the characters that define the Modestus group of species (Brandão, 1990). However, in *M. cupecuara* workers, that agree in all other characters with other members of the Modestus group, the first segment is decidedly larger than the second, although never the double.

F. Fernández (IHVL) kindly loaned me the third known Colombian sample of *M. cupecuara*: 2 workers collected at Valle by R.F. Escalerete, 180 m, Bo(sque), August, 1995 [Usma & Aldaria, RSC-46].

Megalomyrmex goeldii Forel, 1912

J. Delabie, sent me from CPDC a sample of *M. goeldii,* including workers and several "ergatoid" females collected in an old cocoa plantation located at Km 22 of the Itabuna-Ilhéus road (14 48'S, 39°16'W), Bahia state, Brazil. Reproductives are larger and darker than conspecific workers, and retain only the anterior median ocellus (as do ordinary gynes of this species), lacking any vestiges or scars of the lateral ones. Their mesonotuns bear a transverse impression (in side view) and the metanotuns can be clearly differentiated from other sclerites. The dorsal area of the anepisternuns and lateral margins of the katepisternuns bear rugulae.

I failed to notice any difference between workers of this sample and those of queenright colonies workers from southern localities. It is interesting to note that these are the only colonies from which ergatoids are known, and they come from the periphery of the species distribution, northern in this case.

Later on, J. Diniz visited the same locality (but in a specific location called Parque Zoobotânico) and found a *Megalomyrmex goeldii* colony with several ergatoids (voucher workers at MZSP). Unfortunately, we do not know if all of them were inseminated, as is the case for many other *Megalomyrmex* species. Queenright colonies from southern localities may have several inseminated dealated gynes (see Brandão, 1990:424). I studied, from the same locality but unfortunately not from the same colony series, seven males collected by P. Terra in March 3, 1988 (# 4587). In these specimens the pronotum is strongly depressed, representing one extreme of the tendency already noticed in southern samples.

Jones *et al.* (1999) compared the amount of different venom alkaloids present in *M. goeldii* ergatoid gynes and workers.

In July 1987, I collected 30 foraging workers of *M. goeldii* on a rotten stump in a dense evergreen primary Atlantic Forest reserve, Parque Municipal Baepi, Ilha de São Sebastião, São Paulo state, Brazil, 500 m of altitude (23°50'S, 45°18'W). Although I failed to locate the nest, this sample helped to confirm that, in workers from the southern end of the species distribution, the epipetiolar carina is not complete over the foramen (Brandão, 1990:424).

From the Los Angeles County Museum (LACM), I received three workers of *M. goeldii* from "Brazil" mounted on one pin, from the U.S. Quarantine at Hobboken, New Jersey, collected in July 16, 1947 by McMaster & Adams in wild *Cattleya purpurata* (# 47-10233).

I studied three workers of *M. goeldii* collected by M. Queiroz in a coffee plantation in Viçosa, Minas Gerais state, Brazil, in April 26, 1988 (20°45'S, 42°53'W), deposited in the MZSP. Soares *et al.* (1998) collected *M. goeldii* visiting sardine/honey baits set in a secondary growth semideciduous forest in the same locality.

Megalomyrmex goeldii seems to be fairly common in the localities where it has been recorded, but populations seem to be widely scattered. This may be related to the fact that in some populations of this species, the female reproductives are ergatoids, and hence dispersion is severely limited. These ants are easily attracted to baits, so it may be reasonable to conclude that they do not occur in places where they have never been found using baits. However, Yamamoto (1999) surveyed the litter ant fauna in the Estação Biológica de Boracéia, Salesópolis, São Paulo state, Brazil (23°39'26"S, 45°53'36"W), 843 m above sea level, an Atlantic Forest reserve pertaining to the MZSP. The author collected 132 individually sifted 1 m^2 litter samples submitted to Winkler extractors, obtaining a total of 95 ant species in 1304 records (record in this case means a species recorded in a given sample). *M. goeldii* was recorded 14 times in the survey (1.1% of all records), in a locality previously surveyed by sev-

eral ant researchers and where specimens of *M. goeldii* were never found so far. Notwithstanding, *M. iheringi* (see below) has not been found recently in the E.B. Boracéia, a locality where it was still fairly common in the beginning of the twentieth century.

As part of an ongoing leaf litter ant fauna survey along the Atlantic forest, financed by FAPESP, A.A. Tavares (2002) collected 50 individually sifted 1 m^2 litter samples submitted to Winkler extractors for 48 hours, in Ribeirão Grande, Parque Estadual Intervales, Base Barra Grande, São Paulo state, Brazil, in February 5, 1999. *Megalomyrmex goeldii* was recorded four times in the survey. In Parque Estadual Serra do Mar, Núcleo Cunha-Indaiá Cunha, São Paulo state, Brazil (23°15'03"S, 45°00'26"W), Tavares repeated the procedure and recorded *M. goeldii* 20 times. The species seems to be one of the most common litter inhabiting ants in these localities.

Megalomyrmex iheringi Forel, 1911

The Estação Biológica de Boracéia, from where most of the few known samples of *M. iheringi* came from, is located some 70 Km in straight line from the previously mentioned Ilha de São Sebastião. This island is separated from the mainland by the relatively narrow São Sebastião Channel (less than 2 Km in the narrower width), and it is covered by vegetation which is very similar to that of the Serra do Mar. In my 1990 revision, I listed a worker of *M. goeldii* from Boracéia, although a re-examination of this individual led me to re-identify it as a very small *M. iheringi*. This raises doubts on the identity of *M. iheringi,* as I used overall size as the main diagnostic character between them. This was also the only locality where sympatry was ever recorded among these two species (see below). It seems premature to consider them conspecific given that the two species consistently differ in the length of the trunk.

I also studied a worker (CPDC collection # 143) from Parque Estadual Carlos Botelho, São Paulo state, Brazil (24°00'-20'S, 47°44'-48'W) collected with "Taz" (sic) bait by Y.M.B. Neptume in January 13, 1991. This collection was made probably around the headquarters of the Park. The latter covers parts of Eldorado Paulista, Sete Barras, Tapirai and São Miguel Arcanjo counties. This is an additional record of *M. iheringi* with consistently larger measurements of Weber's length of thunk than in any *M. goeldii*.

Recently, Tavares (2002) collected a worker of *M. iheringi* at 750 m of altitude from sea level in Base Barra Grande, Parque Estadual Intervales (24°17'02"S, 47°45'20'30"W), São Paulo state, Brazil, syntopic with *M. goeldii*, also from 1 m^2 litter samples subjected to Winkler extractor. This is the southernmost record for this species.

Megalomyrmex modestus Emery, 1896

The type locality of this species in Costa Rica is Suerre (near Jimenez) in the Limón province, and not in the Alajuela province as stated by Brandão (1990).

Three workers of this species, from Rio Toro Amarillo, near Guapiles, Alajuela province, belonging to the MZSP collection, were erroneously listed in the 1990 revision as gynes. Also from Costa Rica, I received from the LACM two workers of *M. modestus* collected in La Selva, Heredia province (10°26'N, 83°59'W), March 1974 and August 4, 1974 (# 0515-1740) in pitfall traps set at the forest litter by Talbot & Van Devender. From the INBC collection, I received several workers of *M. modestus* collected at Río Peñas Blancas, Alajuela province (10°19'N, 84°43'W), 800-950 m, by J. Longino (different acc. numbers and dates), including a gyne and a male (# 2019) collected in April 27, 1988. J. Longino also sent me two *M. modestus* workers from Reserva Biologica Hitgi-Cerere, Limón province, Costa Rica (09°40'N, 83°02'W), 200 m of altitude, collected in August 29, 1985, # 942-S.

From Venezuela, John Lattke kindly sent me two samples of *M. modestus* workers (24 an 13 workers respectively) from, Ayan Tepui, 1500 m of altitude (ca. Salto Angel) Estado Bolivar (5°57'N, 62°30'W), collected in November 19, 1984 by J. Lattke & K. Jaffé (leg. # 611), and southwestern Kamarcabarai Tepui, 1800 m, 50°53'N, 62°01'W, collected in May 24, 1986 by J. Lattke (leg. # 853).

From Instituto Humboldt, I recently studied four workers collected in October 28, 2000 at Parque Nacional Farallones de Cali, Embalses de Alto Anchicaya Valle del Cauca, Colombia (03 26'N, 76°48'W), 650 m of altitude (W1), by S. Barrio and others. From the same locality and collection (altitude 900 m), I studied another sample of nine workers collected using Malaise traps in November 8 to 21, 2000 by S. Sarria (samples M. 1105, 1111, and 1114). From the IHVL collection, I studied a very tiny dealated gyne collected in Reserva Nacional La Planada, Nariño, 1850 m, in July to August 1995, by C. Estrada. The sculpturation on the head disk and mandibles is very much effaced, while in the mesopleura and over the

propodeum the sculpture is much stronger than in the other studied gynes. However, this Colombian specimen agrees in all other characters with *M. modestus*, and could represent a microgyne, expected in a genus like *Megalomyrmex* where female reproductives vary in size and development from typical alate gynes. A worker from the same sample agrees with other *M. modestus* workers. I also studied another worker of the same species, from the same locality (01 09'N, 77°68'W), collected by F. Escobar in 1994 (leg. # 39).

Megalomyrmex wallacei Mann, 1916

This species has been previously recorded only in the states of Amazonas and Rondônia in Brazil. Recently the MZSP received several samples from this species after the publication of my 1990 revision, extending *M. wallacei* known distribution. I had already commented on the extreme variation of the sculpturing pattern shown by specimens of *M. wallace*i, but should add that even the mandibles can be completely shiny and smooth, especially in samples from the northern part of its distribution.

From the Brazilian state of Amazonas I studied the following new material: twelve workers from Lago Jacaré, Manacapuru (3°28'S, 45°18'W), collected by Boris Malkin in March 26 to 28, 1963, (MZSP); four workers from Rio Tarumã-Mirim, Igapó (3°02'S, 60°11'W), collected by Joaquim Adis in January 6, 1977 (pitfall traps BoF-TM # 42 and 32) (determined as *M. wallacei* by Roy R. Snelling) (LACM), two workers, one collected in Novo Airão, Rio Unini, right margin of Igarapé Acajuri (01°38'25"S, 61°39'19"W), "mata primária", in November, 20 to 23, of 1995 by Bindá & Alencar (pit-fall trap # 8), and the other from the same locality, date and collectors, at the left margin of a lake (Lago Pedras, 01 38'25"S, 61°39'19"W), also in "mata primária" (pit-fall trap # 10) (INPA). From the CPDC collection (# 794), I studied a worker collected by Dr. Forbes Benton in Reserva Ducke, Manaus, in April, 1991.

From Pará state, I studied two workers from Tucurui (Berro d'Água) (3 42'S, 49°27'W), collected in August 18, 1979 by W.L. Overal.

I collected several workers, four gynes and three males (see description below) from four colonies, in September 27, 1987, Maracá Island (3°25'S, 61 40'W), near "Furo do Igarapé Firmino", more precisely near the mouth of this small creek into the Uraricoera river, state of Rodônia, Brazil. The colonies with up to 300 workers, one gyne, and immatures, live under dead leaves of the litter. Workers keep the larvae in between the mandibles. When disturbed, they spread out to rejoin after some minutes under a different leaf.

R.R. da Silva and N.L. de Albuquerque obtained three workers of *M. wallacei* from a 1 m^2 sample of litter, submitted to Winkler extractor, taken from a gallery forest inside the savanna (cerrado) in Palmeirante, Tocantins state (formerly the northern half of Goiás state), Brazil (07 52'25"S, 47°57'07"W) in December 10 to 15, 2001. This sample represents the eastern record of the species and shows the smallest values in all measurements for workers of *M. wallacei.*

From J. Longino, I received ten workers and a male from Estación Biologica La Selva, Heredia, Costa Rica, 50 to 150 m of altitude (10 26'N, 84°01'W); eight workers with the same label: "Apr. 1994, INBIO-OET (N. Barger & J. Longino baiting study NNB/PLT 02)"; one worker bears the label "J. Longino # 3733", and the male label says: "17 Ene 1993 bosque secundario M/00/002". Longino has also collected 2 workers from Rupununi, Karanambo, Guyana (3 45'N, 59°20'W), 100 m elevation, in January 16, 1981.

From the CPDC collection (# 991), I studied a worker collected in Cerro Pirre, Darien, Panamá in August 26-30, 1991 by R. Ruiz.

F. Fernández (IHVL) kindly loaned me the first Colombian samples of *M. wallacei*: four workers collected in Parque Nacional Utria, Chocó province (06 01'01"N 77°20'66"W) Ensenada, Bosque Abierto, in May 21, 1991 by M. Baena (labels says 77°20'66"N, instead of W), and Caparu Igapo, Vaupes province 100 m elevation, "Ex humus 1 cm", by D. Forero in December 1, 1995. One additional worker from the same locality bears a label saying: Colombia, Guajira?, collected from March to June, 1981 by J. Rincón. Also from IHVL collection, I studied a worker from Valle del Cauca, Parque Nacional Farallones de Cali, Embalses de alto Anchicaya (03 26'N, 76°48'W), 750 m, W2, collected in October 13, 2000 by S. Sarria and others. The integument of the specimen is completely smooth and it is rather small for a *M. wallacei.* However, the specimens show all the other characters diagnosing this species, being now also known from Eastern Colombia. *Megalomyrmex modestus* from the Modestus species group was recorded at this site, but *M. modestus* workers are easily separated from *M. wallacei* workers by the characters discussed by Brandão (1990).

Gynes

In the 1990 revision, I stated that the gyne bodies are totally covered by rough punctures. However

the samples studied and described herein furnished gynes with bodies mostly smooth and shining, while other individuals from other localities have bodies totally sculptured, or with intermediates between these conditions. In general, workers and gynes from the same colony share the same sculpturing pattern. In Maracás, for instance, the propodeal faces of both workers and gynes are covered by coarse transverse reticulations.

Males (first description)

Clypeus not swollen, smooth; mandibles smooth with four large teeth in the cutting edge, with some small denticles superimposed on the large ones; three equally developed ocelli with surrounding coarse sculpture; head otherwise smooth and shining, as the rest of the body; 2nd to 5th funicular segments darker than the others; mesonotum with parapsidial furrows, and notaulus; propodeum declivity much longer than basal face, declivity bears 3-4 concentric rugosities over the foramen and a complete epipetiolar carina; petiolar node compressed antero-posteriorly, with the lateral angles produced laterally; ventral process of postpetiole globose.

Leoninus group

In my 1990 paper, I said that instead of true winged gynes, members of this group present gamergates as the sole female reproductives. Although true winged gynes of the *Megalomyrmex* of the Leoninus group of species have never been found, yet the current nomenclature for wingless gynes in the Myrmicinae applies the term "ergatoids" to similar cases, meaning they are modified evolutionary descendants of winged gynes (see revision in Hölldobler & Wilson, 1990). However, until now I am not aware of any detailed study of the reproductive biology of any species of Myrmicinae in which the female reproductives are similar in size and shape to the sterile workers – a phenomenon that seems to be more common than previously believed.

In any case, permanent wingless female reproductives affect speciation, dispersion rates, and intraspecific variation, making the specific recognition rather problematic in this group of species. I would like to point out what I consider to be one of the most important results of wingless females, namely that colonies of *Megalomyrmex* of the Leoninus group of species do not construct or excavate nests, but rather occupy pre-formed spaces among rocks, under bark or within the leaf litter, readily moving away immatures when disturbed. This behavior also prevents their establishment in laboratory nests; in my experience there are no other myrmicine ants as difficult to keep in laboratory conditions as the species belonging to this group. As soon as they are transferred to artificial nests, each worker grabs an immature (or a group of them [if they are small enough]), and runs away to the nearest hiding place without any apparent coordinated behavior, to join nestmates only by chance afterwards.

In relation to the brief characterization provided in 1990 for females of this group, I should add that in larger specimens it is often possible to observe the small mesonotum spiracle openings, at the anterolateral dorsal border of the metapropodeal sulcus.

Jones *et al.* (1999) described the pyrrolidine alkaloids found in extracts of two species in this group, *M. cyendyra* Brandão and *M. latreillei* Emery. Pyrrolidines are well known venom components of other myrmicine ants in general and have been detected also in *M. leoninus*.

Megalomyrmex acauna Brandão, 1990

This species was described from two samples collected in Gustavo Dutra and another locality in the Chapada dos Guimarães, near Cuiabá, Mato Grosso state, Brazil. Dr. Antonio Mayhé-Nunes visited the area recently and found out that Gustavo Dutra was actually the name of an Agricultural School. The small village is now known as São Vicente, and is located in the county of Santo Antonio do Leverger, some 100 Km East of the state capital, Cuiabá.

Megalomyrmex acauna is the only Leoninus group species recorded in the "cerrados". The Leoninus group is otherwise an entirely Amazonian group. In fact, Prof. Marcelo Tavares sent me recently a sample from the Indian Reserve Tadarimana, Rondonópolis, state of Mato Grosso state, Brazil (16°28'S, 54°38'W). I collected in May 6 to 29, 1996, two colonies of *M. acauna* in Uruaçu, northwestern Goiás, Brazil (14°17'06"S, 48°55'01"W). Both localities are situated within the "cerrado" biome. The ants live in fairly large colonies that occupy spaces among stones, in a way that is very similar to the most closely related species, *M. balzani*. In both cases the colonies were found along gallery forests and all attempts to rear them in the lab failed.

From LACM, I received a male of *M. acauna* (undescribed) collected by F.S. Truxal in June 13, 1956, in a locality 24 Km East of Formoso (13°37'S, 48°54'W), Goiás state, Brazil.

Male (first description)

Clypeus smooth without anterior denticle; cephalic integument smooth next to the compound eyes: first funicular segment similar in size to scape, second and third smaller; mesonotum with parapsidal furrows impressed, but no notaulus; epipetiolar carina complete; dorsal face of propodeum smooth; petiole compressed dorso-ventrally; petiolar spiracles laterally produced; petiolar and postpetiolar nodes almost indistinct; postpetiole without ventral process; genual plates rounded.

Megalomyrmex balzani Emery, 1894

J. Diniz and I collected in October 1, 1987, a large colony of *M. balzani* on the campus grounds of the Universidade Federal do Amazonas, in Manaus. Most individuals occupied a space hidden among the root system, litter and moss of a large tree, but a trail led to a space under bark some 1 m high on the live trunk, where part of the colony was found. The colony had more than 400 workers and several immatures, all brought alive to the Museu de Zoologia, but again, they did not survive for more than a few weeks in artificial conditions.

P. Ward sent me a worker of *M. balzani* he collected in Fazenda Esteio, 80 Km northeast of Manaus (02°25'S, 59°46'W) (80 m), in September 15, 1987, (accession number 9150-2).

From LACM, I received 9 workers collected by W. Davidson in February 16, 1987 (TAM-1), in Reserva Tambopata, Madre de Dios, Peru, and a worker from Pozuzo, Huanuco province, Peru (10°04'S, 74°32'W).

From Dr. Jacques Delabie, I received two workers of *M. balzani* (Ceplac # 302) labeled "Brasil: PA, origem provável". This represents the first record of this species in Pará state, where they do probably occur.

The AMNH collection houses a worker from Rio Purus, Amazonas state, Brazil, collected (date unknown) by A. Goeldi. The specimens belong to *M. balzani* and not to *M. bituberculatus* Fabricius as the label says.

Megalomyrmex bidentatus Fernández & Baena, 1997

This species was described based on workers collected by F. Escobar in two localities within the county of Barbacoa, Nariño province, Colombia (see localities description in Fernández and Baena, 1997): Tajadas, 1000 m (accession number 446), and Reserva Natural Río Nambí (see Escobar & Valderrama, 1995). Fernández deposited one specimen labelled as paratype from Rio Nambí at the MZSP, but in the original description, after giving information on the holotype, the authors say: "Obrera paratipo: Una obrera con los mismos datos del holotipo depositada en MZSPC; 13 obreras...", although in the measurements section they present figures taken from 13 "paratype" workers. I consulted Fernández, who agreed that their intention was to consider all 14 known specimens as types, so, with their agreement, I hereby correct this information, and thus consider also the specimens from the second locality as paratypes.

The original description includes characters I used to define the Leoninus group, except for the bidentate propodeum, which is apparently the only apomorphy for this species. *Megalomyrmex foreli* and *M. timbira* may have pointed propodeal angles, but never produced as pointed teeth as in the *M. bidentatus* paratype examined. To the original description I should add that the paratype lacks paired pointed acrosternites at the meso and metasternae. Also Fernández & Baena (*op. cit.*) rightly call attention to the shape of the head, which in this sample, is greatly modified in relation to other species in this group, being much longer than broad.

The only species in the Leoninus group recorded thus far in such high Andean altitudes is *M. foreli* (see below), which can be distinguished from *M. bidentatus* by the presence of a conspicuous sharp tooth on the ventral side of the postpetiole, that may be worn out (if so leaving a noticeable scar), but never completely lacking as in *M. bidentatus*.

Megalomyrmex cyendyra Brandão, 1990

Workers of *M. cyendyra* sometimes have the propodeal declivity mostly smooth, with very faint rugosities over the foramen, and the epipetiolar carina incomplete. The main diagnostic characters that separate this species from all other *Megalomyrmex* of the Leoninus group is the number of club segments (4-5) and the continuous promesonotum.

I studied three Colombian samples belonging to the IHVL collection collected in Reserva Nacional La Planada, Nariño province: two workers collected at 1800 m "interior bosque" (01°17'N, 78°15'W), one collected by F. Escobar and the other by C. Estrada; two with the same locality data collected from February to July, 1993, by C. Estrada; and two workers collected in the Parcela Olga by G. Oliva, in July 16 to 20, 2000, at 1850 m (01°15'N, 78°15'W).

Jones *et al.* (1999) studied the venom alkaloids of *M. cyendyra* workers collected in July, 1997 in Borrero Ayerbe, Municipio de Dagua-Corregimiento, Departamiento del Valle, Colombia.

Megalomyrmex emeryi Forel, 1904

Until now, the only known specimen of the rather aberrant *M. emeryi* is a worker, the holotype, collected somewhere in Suriname (see Brandão, 1990). I tentatively assigned a male from southern French Guyana to this species, which has also aberrant characters in relation to the known males of other species in this group, and does not belong to any of the species in the Leoninus group known to occur in the region. It was with great surprise that I received from the LACM 6 workers clearly belonging to this rather distinctive species from Boquerón (500 m), Loreto, Peru collected by J. Schunke in July 7 to 14, 1965, and bearing a label that reads "*M. latreillei* Emery, R. Hamton det.". At first, I thought the extreme modifications could be the result of some kind of parasitism, but I am not aware of any case where parasitism might have resulted in such extreme modifications, particularly involving the characters that separate *M. emeryi* from all other taxa in this species group. Notwithstanding, since this new sample comes from a locality so distant from that of the holotype, I cannot rule out this hypothesis.

Megalomyrmex foreli Emery, 1890

Megalomyrmex foreli Emery, 1890:46-47, pl. 5, fig. 3, worker. Type Locality: Jimenez, Limón, Costa Rica (10°13'N, 83°43'W). Forel, 1899:57-58, male.

Megalomyrmex latreillei Emery, 1890:47, pl. 5, fig. 4, worker. Type Locality: probably San Antonio de Cumbasa (see Brandão, 1990), San Martin, Peru (06°21'N, 76°19'W). Brandão, 1990:436, male. Nov. Syn.

I. Zelner-Polania sent me for study three samples of *Megalomyrmex* of the Leoninus group from localities in Colombia that fill the gap in the known distribution of *M. foreli* and *M. latreillei*. These are: one worker from Caño La Curia, 580 m, Reserva Nacional La Macarena (02°45'S, 73°55'W), Meta province, collected by F. Fernández, two workers collected at the banks of Rio Guayuriba, Meta province, by Richter in December, 1950 to January, 1951, 500-700 m (03°55'S, 73°05'W), and six workers from Doncello, collected by Zelner-Polania in February, 1991. These samples are intermediate in all characters I thought could separate *M. foreli* from *M. latreillei*, including color pattern; therefore, I propose the synonymy of the former under *M. foreli*. The resulting taxon is very variable in character states otherwise constant in the genus, as the postpetiolar ventral process that, in certain localities (particularly in Colombia), can be strongly produced into a long and thin spine, lacking or completely worn out in specimens from other places, although the anteroventral margin of the postpetiole in this case is always sharp. This process wears out with age, leaving only a scar.

In these specimens, the gasters are concolorous with the rest of the body. The gaster is often darker in this species. Specimens from Costa Rica and Ecuador (limits of the known species distribution) are lighter in color than those from Colombia and Brazil (Acre).

From IHVL, I received two samples of *M. foreli* from Caquetá, Colombia: two workers from San José del Fragua, R. Turayaco, 1000 m, collected in tuna baits in September 1 to 8, 2000 by E.L.G., and four workers from Parque Nacional Picachua (02°47'51"S, 74°61'18"W), 1500 m collected manually by F. Escobar and E. Gonzales (no. 5), in November 18, 1997.

I examined also a worker of *M. foreli* collected by L.A.T. de Alonso (LET # 828) with ground tuna bait in primary forest in Jatun Sacha, Napo Province in Ecuador in January 26, 1994, and two workers collected by J. Longino, in February, 26, 1981 in Rio Niño (300 m) (08°31'S, 83°38'W), Osa Peninsula, Corcovado, Costa Rica.

From J. Delabie I received a worker (CEPLAC # 991) collected in Darien, Cerro Pirre, Panama, in August 26 to 30, 1991 by R. Ruiz. It is clearly a member of the Leoninus group. *Megalomyrmex foreli* is the only species in the Leoninus group that probably occurs in Panama, although I have samples only from Costa Rica and Colombia and not from Panama itself. This particular specimen, although too small in relation to all other samples of *M. foreli* studied so far, shows the color pattern of the Costa Rican samples of *M. foreli*, but lacks an anteroventral process of the postpetiole. As I have seen only one specimen, I refrain to describe it as a new species for the time being, hoping to study more material of the Leoninus group from Panama.

Jones *et al.* (1999) studied the venom alkaloids of *M. foreli* (= *M. latreillei*) workers collected in Garza Cocha-Añyagu, 175 km eastern of Coca, Provincia de Sucumbios Ecuador in August 12,1994. I have not studied this material.

The locality record "Colombiana Farm" in Brandão (1990) is in the Alajuela province, and not in Santa Clara, as stated.

Megalomyrmex glaesarius Kempf, 1970

This species was known only from the type specimens from Llama, Cajamarca, Peru and from one sample collected 94 Km southwest of Cuencas, Nieves, Napo, Peru. I recently studied the first Colombian sample: two workers (IHVL) collected by F. Escobar at 1000 m in Tajadas, Barbacoa, Nariño, Colombia in May 1, 1994. These workers have the gaster with the same color as the rest of the body, while other samples of this species have the gaster decidely darker, almost shiny black, including the males from lago Agrio (see Brandão, 1990), not included in *M. glaesarius* for biogeographic reasons. However, in all other characters, the Colombian sample agrees with the diagnosis for *M. glaesarius*, extending further north the known distribution of this species. Nothing is known on the biology of *M. glaesarius*.

Megalomyrmex leoninus Forel, 1884

I. Zelner-Polania sent me one sample of *M. leoninus* from Carare (alt. 400 m), Santander, Colombia (06°47'S, 74°07'W) collected by Richter in May 8, 1939.

F. Fernández sent me from the IHVL collection two Colombian samples of *M. leoninus*: two workers collected in Rebalse, Caño Cocuy 180 m (Moyano, Nukak Maku Creek) Guaviara (02°10'40"S, 71°11'26"W), collected in January 30, 1996; and two workers from Finca Buenos Aires, La Teja, Município Güepsa, Santander, 1480 m (06°01'32"N, 73°35'02"W), collected by Y. Martinez in February 11, 1999.

Megalomyrmex staudingeri Emery, 1890

Also from I. Zelner-Polania I received two workers of *M. staudingeri* collected in January 3 to 6, 1987, in Caño La Curia, Reserva Nacional La Macarena, 580 m. Meta, Colombia, sympatric with *M. foreli*.

Also from Colombia, I studied three samples sent by F. Fernández from the IHVL collection, as follows: one worker from Orito, Terrritório Kofan, Narinõ (00°30'N, 77°13'W), 700 m, bosque, cebo A3, collected in November 29, 1998 by E.L. Gonzales; one worker from R. Mesay, B. Amarillo, Parque Nacional Chiribiquete, Caquetá Solano, 300 m, (T1. T5), collected in January 28, 2000 by F. Quebedo; and three workers collected in Alto de Herrera, Diamante, Parque Nacional Tamá, Norte de Santander, 1000 m (07°07'N, 72°13'W), bosque, in November 22, 1999 by E. Gonzales.

From LACM, I studied eight workers of *M. staudingeri* collected in Estación Biologica Cocha Cashu, cerca 400 m of altitude, Departamiento Madre de Dios, Peru, collected in September 9, 1986 by D. W. Davidson in wet forest (accession number 86-4).

Megalomyrmex timbira Brandão, 1990

I described this rather distinctive species based on two workers collected by John Lattke (FAM) in La Flautera (ca. Palmira) Tachira province, Venezuela, but received since then three more samples, all collected by the same collector in the same Venezuelan Tachira province, as follows: one worker from El Espinal ("entre Michelena y Colón", 1260 m of altitude, August 9, 1983 (08°59'N, 72°15'W); two workers from San Cristóbal, La Parada Los Pirineos, 1100 m, September 13, 1984 (collected with G. Vivas) (07°46'N, 72°14'W for San Cristóbal) and two workers from Quebrada La Bermeja, Loma del Rio Sán Cristóbal, 1100 m, August 12,1983 (collected with G. Borges; Formicidae 379, I.Z.A. – U.C.V.). They agree in all originally cited characters with the types.

I studied a worker of *M. timbira* collected in Orito, 1000 m, bosque, Terrritório Kofan, Narinõ, Colombia (00°30'N, 77°13'W), in November 24, 1998 by E. L. Gonzales (IHVL).

To distinguish *M. timbira* from *M. staudingeri*, as they seem to occur sympatrically at the Colombian-Venezuelan border, I used not only the peculiar propodeal shape in *M. timbira*, but also the fact that in *M. timbira* the petiole is almost twice as wide as the postpetiole, while in *M. staudingeri*, they are of similar width. The shape of the postpetiole is similar to that depicted in figure 83 in Brandão (1990), while the dorsal profile of the postpetiole is always evenly rounded.

To the original description, I should add that the epipetiolar carina in *M. timbira* is complete around the foramen, although in some specimens the carina almost fades out at the mid propodeal declivitous face. Some specimens are distinctly more hairy in relation to the type specimens and to other *Megalomyrmex* species in the Leoninus group.

Silvestrii group

Megalomyrmex cuatiara Brandão, 1990

M. cuatiara was described from the Colombian Amazon (Bolivar, Putumayo and Meta provinces); I have recently received from INPA two series with four and three workers respectively, both collected in Manaus by A.B. Casemiro in October 20, 1993 (A3", # 4832 – Rs 2108), and in November 10, 1993 (N9", # 4832 – Rs 1202). Although there is no indication in the labels, Casimiro often collected ants sifting superficial soil and leaf litter samples, what can partially explain why this rather distinctive species has never been recorded before in Manaus – a place visited already by many ant specialists that traditionally collected mostly manually. These are the first non-Colombian records for *M. cuatiara.*

Megalomyrmex mondabora Brandão, 1990

The correct spelling for the type locality of this species is Turrialba, Cartago province, and not "Turialba" as stated in the original description (Brandão, 1990: 442).

Megalomyrmex poatan Brandão, 1991

Megalomyrmex poatan was described from a unique worker recovered from a leaf litter sample collected in San Pedro de la Sierra, Magdalena, Colombia submitted to Berlese. I received from the MCZ a second sample of this species, including 12 workers and one gyne (description below) from 15 Km north of Puerto Maldonado, Tambopata Province, Cuzco Amazonico, Peru, collected by S.P. Cover and J. Tobin (CA-27), elevation 200 m (12°36'S, 69°11'W). Three subsamples, including respectively three, two and one worker bear distinctive labels that read: "Camp. sifted litter from compost pile by trail to zone 1; Camp. in compost pile under bananas at forest edge, berlesate # 148; and seasonally flooded forest, plot ZUZI, flower fall, berlesate # 468". As for the workers, the main difference of these specimens in relation to the holotype is that the mesonotum is higher than the base of the dorsal face of propodeum in dorsal view. The anterior denticle of the petiole ventral face is not as developed as in the holotype, but can be seen with high magnification (80X). The petiolar postero-dorsal face has very faint rugosities, while the holotype shows conspicuous rugosities.

Gyne (first description)

Three equally developed ocelli; mesonotum with parapsidal sutures but no notaulus; katepisternum distally rugose, the rugae continuing through the metapleura; propodeum dorsal face and declivity continuous and completely covered by rugosities, similar to those found in the workers; petiole with a series of transverse rugosities covering the whole ventral face, at the distal end of the petiole, the rugosities cover also the lateral faces, but do not reach the apex; the postpetiole posterodorsal face has one continuous rugosity just before the socket, although the rugosities are absent on the ventral face.

Megalomyrmex silvestrii Wheeler, 1909

J. Trager collected an alate gyne and 15 workers of this species at "Base de Pesquisas do IBDF, Km 115, Transpantaneira road (field # 0316, rotten wood), Poconé, Mato Grosso, Brazil (16°15'S, 56°37'W), in November 28, 1984 (MZSP).

R. Silvestri collected eight workers using sardine baits set on the soil at night, in Cajurú, São Paulo state, Brazil (23°24'S, 47°23'W) in April 24, 1993.

R. Pinto da Rocha and Barreto recovered a worker and a dealated gyne of *M. silvestrii* from a berlesate sample taken in Pinhão, Ribeirão Estreito, Usina Hidroelétrica Segredo (25°43'S, 51°38'W), in a tributary of Rio Iguaçu, state of Paraná, Brazil, in March 20, 1992.

Jacques Delabie, from CPDC, Itabuna, Bahia state Brazil, sent me two samples of *M. silvestrii* collected in the CEPEC area in Ilhéus, Bahia state, Brazil, respectively # 4407, collected by B. Santos in April 19, 1991 (6 workers), and # 4587, collected by P. Terra in October 21, 1987 (two alate gynes, for males) and same number (three males) collected in February 15, 1989.

The MCZ collection has a worker of this species from Voltzberg, Saramacca province, Suriname (04°32'N, 56°32'W), collected by D.S. Trail in April 14, 1980 in leaf litter.

Soares *et al.* (1998) collected *M. silvestri* in Doane soil traps set in an eucalyptus plantation in Viçosa, Minas Gerais state, Brazil.

Megalomyrmex silvestrii was previously recorded in only one Costa Rican locality, but J. Longino sent me three samples of this species from other localities in Costa Rica, namely Parque Nacional Santa Rosa, provincia Guanacaste (10°51'N, 85°37'W), 300 m July 12, 1985 (1 dealated gyne, 2 workers) # 420-S; Parque Nacional Corcovado, provincia Puntarenas (08°29'N,

83°36'W), 100 m, December 18, 1990 (2 workers) # 2769-S; and Reserva Biologica Hitgy-Cerere, provincia Limón (09°40'N, 83°02'W), 500 m, collected in August 30, 1985 (1 worker) # 970-S. The locality record for this species previously referred as Bataan, Santa Clara, Costa Rica in Brandão (1990), is in fact in the Limón province and not in the Santa Clara province.

R.R. da Silva collected two workers of *M. silvestrii* in Winkler extracted litter samples from Seara, Santa Catarina state, Brazil (24°07'S, 52°18'W) from May to December 1998. A.A. Tavares and R.R. da Silva collected 50 individually sifted 1 m^2 litter samples submitted to Winkler extractors for 48 hours in Praia Grande, Parque Estadual Serra do Mar, Núcleo Pilões-Cubatão (23°58'31"S, 46°32'24"W), from May 26 to 27, 2001, and Iguape, Núcleo Juréia-Itatins, Parque Estadual Serra do Mar (24°32'39"S, 47°142'08"W), in March 5 to 14, 2001. *Megalomyrmex silvestrii* was recorded respectively once and twice.

Megalomyrmex symmetochus Wheeler, 1925

New records for *M. symmetochus* are as follows: Rio Manacapuim, Amazonas state, Brazil, collected in March 27, 1967 by the Expedição Permanente da Amazônia (MZSP), and recovered from MZSP Isoptera collection # 1382; one sample from the MCZ collected at 15 Km N of Puerto Maldonado, Tambopata Province, Cuzco Amazonico, Peru, in June 23 1989 by S.P. Cover and J. Tobin (CA-426), at elevation of 200 m. There are two workers of a minute attine *Sericomyrmex* with the same number are labeled as host for *M. symmetochus*. The type series of this species has also been collected within a nest of the much bigger *Sericomyrmex amabilis* (Wheeler, 1925:162). A sample from Belém (IPEAN), Pará state, Brazil, was recovered from an unidentified *Trachymyrmex* nest.

The locality record for this species "Hamburg Farm" as cited in Brandão (1990) is located along the Rio Raventazon, Limón province, Costa Rica.

Megalomyrmex wettereri n. sp.

(Figs 1-4)

Megalomyrmex wettereri, n. sp. worker, gyne. Type Loc.: Costa Rica, Heredia, La Selva (10°26'N, 84°01'W), "em ninho *Trachymyrmex bugnioni*" (18 workers), collected by J. Wetterer in March 2,1993, 50-150 m, INBIO-OET; Panama, Panama Prov. Km 7 of El Llano Carti Suitupo Road, in June 07, 1998 (09°18'02"N, 78°57'31"W), Ulrich Mueller 980607-01 (one gyne – funiculus missing, two workers) "NMNH 2014315".

Types

Holotype and five worker paratypes (La Selva) deposited at MCZ, Harvard; five paratypes (La Selva) and two paratypes (worker and gyne from Panama) deposited at the MZSP; five worker paratypes (La Selva) and one worker paratype (Panama) deposited at the USNM; two worker paratypes (La Selva) deposited at the BMNH.

Worker

Mandibles smooth, except for the coarse rugosities at the external area near the base (Fig. 1), dental formula 2+6; palp formula 3:2 (?); anterior clypeal border without median denticle; compound eye with 5 ocular facets at its largest diameter; occipital margin not raised; promesonotal suture not impressed dorsally (Fig. 2), mesonotum undistinguished from pronotum; metanotal groove longitudinally rugose; katepisternum smooth; propodeum spiracles laterally projected in an angle of 45° from the main axis of the body; base with divergent carinae at the meeting with propodeum sides, declivity smooth; epipetiolar carina not complete over the foramen; dorsal profile of petiole, in side view, evenly curved till apex of node, ventral face with a pronounced anteromedian double denticle (Fig. 3) originating in a non-translucent short longitudinal flange; dorsal margin of petiolar node, in frontal view, round; ventral process of postpetiole produced in a sharp tooth.

Color: uniformly bright yellow; apex of segments reddish.

Gyne

Three equally developed ocelli; mesonotum with notaulus; katepisternum distally rugose; propodeum dorsal face and declivity meeting in an angle similar to that of the conspecific workers; petiole and postpetiole also similar in shape and sculpture to the con-specific workers.

Diagnosis

The mandibular dentition and shape of propodeum distinguish *M. wettereri*, n. sp. from all other species in the Silvestrii group.

Comments

This is another *Megalomyrmex* of the Silvestrii group that inhabits the nests of fungus growing ants,

FIGURE 1. *Megalomyrmex wettereri* n. sp. Paratype worker, head in frontal view, see measurements in the text.

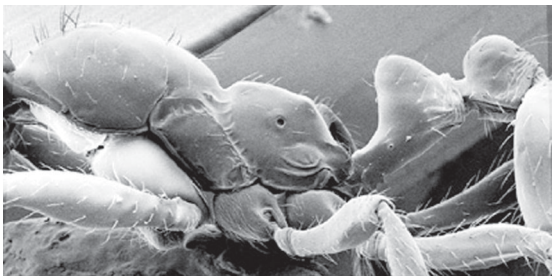

FIGURE 2. *Megalomyrmex wettereri* n. sp. Paratype worker, alitrunk in lateral view text, see measurements in the text.

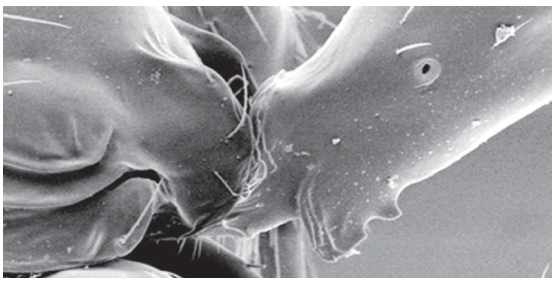

FIGURE 3. *Megalomyrmex wettereri* n. sp. Paratype worker, petiole in oblique ventral view; note the shape of the ventral process; see measurements in the text.

FIGURE 4. *Megalomyrmex wettereri* n. sp. colony inside a *Trachymyrmex bugnioni* nest in La Selva, Costa Rica. Picture taken by J. Wetterer.

in a peculiar lestobiotic relationship. The type specimens were found inside a nest of *Trachymyrmex bugnioni* (Attini), collected by J. Wetterer (Fig. 4), to whom the name of this species is dedicated, and inside a nest of *Cyphomyrmex longiscapus* in Panama collected by U. Mueller.

Adams *et al.* (1998-1999; 2000) described the finding of two colonies of this new species in Panama containing healthy fungus gardens of *C. longiscapus*, although no attines were present at the time of collecting. According to these authors, laboratory observations revealed that the *Megalomyrmex* "consume the fungus by cropping mycelium from the garden substrate. However, they do not forage for and add nutrient substrates, or otherwise tend the fungus garden; thus, when the garden becomes depleted, *Megalomyrmex* sp. must locate and usurp new gardens in other attine colonies". When presented with active colonies of *C. longiscapus*, workers of this new species displace "host" workers in mass raids, stinging and ultimately killing the apparent defenseless *C. longiscapus*. When presented with *C. longiscapus* larvae in the laboratory, *M. wettereri* n. sp. workers strip them of the mycelium layer that naturally covers the cuticle, then place the larvae with their own brood. Adams *et al.* (1998-1999) considered this *Megalomyrmex* as a predator on *C. longiscapus* as they forcibly eject the resident attine to usurp their fungus gardens.

Adams *et al.* (2000) described in detail how this species conducts mass raids to usurp gardens of *C. longiscapus*, then lives in the garden and consumes the fungi. *Megalomyrmex wettereri* n. sp. workers feed their larvae with attine brood only after removing the fungal mycelium that covers the attine larval integument, suggesting that this fungal coat may provide partial protection against predators.

Pusillus group

Workers of the species in this group are relatively small inhabitants of the leaf litter, and hence rare in collections, but the most prone to be collected using recently adopted techniques, such as the Winkler extraction apparatus, soil samples or Berlese funnels.

Megalomyrmex drifti Kempf, 1961

New records from Brazil are: R.R. da Silva collected three workers of *M. drifti* in Winkler extracted litter samples from Seara, Santa Catarina state (24°07'S, 52°18'W). A.A. Tavares and R.R. da Silva collected 50 individually sifted 1 m^2 litter samples submitted to Winkler extractors for 48 hours in Praia Grande, São Paulo state, Parque Estadual Serra do Mar, Núcleo Pilões-Cubatão (23°58'31"S, 46°32'24"W), in May 26 to 27, 2001, and in Iguape, São Paulo state, Parque Estadual Serra do Mar, Núcleo Juréia-Itatins (24°32'39"S, 47°142'08"W), in March 5 to 14, 2001. *Megalomyrmex drifti* was recorded five times and one time, respectively, in the surveys.

From CPDC collection (sample # 1027), I studied a worker from Cuyabeno, Ecuador, collected by P. Caldwell from October 12 to January 05, 1994 (# 10726), and a worker (same accession number) from Nicaragua, collected by I. de Dramante, October 9 to 10, 1994 (# 8652).

From IHVL, I studied one worker collected in Parque Nacional Chiribiquete, Río Sararamano, Caquetá Solano, 300 m of altitude, Colombia (00°10'48"N, 37°24'W), "Winkler 4", in April 07, 2000 by E.L. Gonzáles.

From INBC, I studied several samples of *M. drifti* from Costa Rica collected by J. Longino from sifted leaf litter of wet forest: one worker from Reserva Biologica Hitgi-Cerere, Limón province (09°40'N, 83°02'W), 100 m of altitude, August 29 to September 15, 1985 (# 1008-S); one gyne and two workers from Parque Nacional Santa Rosa, Guanacaste province (10°51'N, 85°37'W), 300 m of altitude, in July 12, 1985 (# 420-S); three workers from three different sites at Heredia province 5, 8, and 17 Km south of Puerto Viejo (10°25'N, 84°03'W), respectively at 100, 150, and 600 m of altitude (accession numbers respectively 1392-S, 1391-S, and 2230-S); five workers collected in Osa, Rancho Quemado, Puntarenas province (08°42'N, 83°33'W), 2 to 300 m of altitude, in December 15, 1990 (# 2760-S); one gyne, one male and two workers from Parque Nacional Corcovado, Puntarenas province (08°29'N, 83°36'W), 100 m of altitude, in December 18, 1990 (# 2769-S); and Estación Biologica La Selva, Heredia province (10°26'N, 84°01'W), 50 to 150 m of altitude, in April 1993.

Megalomyrmex incisus M.R. Smith, 1947

With the help of J. Lattke and E. Cancello I collected a colony of *M. incisus* in a dead twig on the ground in Caripe, Monagas province, Venezuela (10°10'N, 63°34'W), in a very wet afternoon (October 30, 1986). Only adult ants occupied the small chamber under the bark of the twig. The sample includes one dealated female (undescribed) and 28 workers. From the IHVL, I studied a worker from Caquetá Salzano, Colombia.

From the MCZ, I studied a sample of *M. incisus* including one dealate gyne and seven workers collected at Windblow Ridge, Arima Valley, Trinidad (elevation 1800') T-40, in May 15, 1988, collected by S. Cover and M. Moffett, "44 miles past end of Cooker Trace; secondary montane rainforest, about 20 years old, in rotten branch on forest floor". S. Cover already compared the workers with the paratypes of *M. incisus* M.R. Smith in the MCZ (S. Cover det. 1990), with which I concur.

Gyne (first description)

Three equally developed ocelli; mesonotum with parapsidal sutures but no notaulus; katepisternum smooth; propodeum dorsal face and declivity continuous, with only one rugosity over the foramen; petiole ventral face with an anterior denticle, otherwise smooth; the postpetiole posterodorsal face has one continuous rugosity just before the socket, although rugosities are absent from the ventral face.

Megalomyrmex miri Brandão, 1990

The type locality of this species is Zent, Limón province, Costa Rica. The specific locality is missing in the original description.

Megalomyrmex myops Santschi, 1925

Soares *et al.* (1998) collected *M. myops* in Doane soil traps set in a secondary growth semideciduous forest and eucalyptus plantation in Viçosa, Minas Gerais state, Brazil.

Megalomyrmex pusillus Forel, 1912

Of this rather rarely collected, although very distinctive species, I received from CPDC a worker collected in Poços de Caldas, Minas Gerais state, Brazil (21°48'S, 46°34'W), in October 28, 1991, by A.M.D. Aguiar. This is the first record of this species in Minas Gerais.

RESUMO

Reviso, pela segunda vez, o gênero neotropical de formigas Megalomyrmex *Forel (Myrmicinae: Solenopsidini), descrevendo* M. wettereri *n. sp. do grupo Silvestrii com base em operárias e gines (rainhas).* Megalomyrmex latreillei *Forel é sinonimizada sob* M. foreli *Emery. A gine de* M. poatan *é descrita e a de* M. wallacei *é redescrita; os machos de* M. acauna*,* M. incisus *e* M. wallacei *são descritos. Novos registros de localidade são apresentados para* M. ayri, M. cupecuara, M. goeldii, M. iheringi, M. modestus, *e* M. wallacei *(grupo Modestus);* M. acauna, M. balzani, M. cyendyra, M. emeryi, M. foreli, M. glaesarius, M. leoninus, M. staudingeri, *e* M. timbira *(grupo Leoninus)*; M. poatan, M. silvestrii, *e* M. symmetochus *(grupo Silvestrii), e* M. drift, M. incisus, M. myops *e* M. pusillus *(grupo Incisus). Novos dados biológicos são apresentados para* M. acauna, M. goeldii, *e* M. wallacei *e outros comentários são apresentados para* M. bidentatus*,* M. miri *e* M. mondabora.

PALAVRAS-CHAVE: Hymenoptera, Formicidae, Myrmicinae, taxonomia, biologia.

ACKNOWLEDGMENTS

This work would not have been possible without the generous support of several colleagues and, especially, my students, who sent me *Megalomyrmex* samples after the publication of my 1990 revision. I take this opportunity to thank them all together (see comments under each species). FAPESP and CNPq have been funding my projects over the years. CNPq financed a trip to Venezuela in 1986, and FAPESP a series of projects to the Brazilian Central Plateau and the Atlantic Forest, resulting in the collection of several specimens of *Megalomyrmex*. Dr. Nelson Jorge da Silva, from Universidade Católica de Goiás, in Goiânia, is acknowledged for inviting my students and me to participate in the survey project in northern Goiás, from where important specimens recorded in this addendum came from. James Wetterer kindly allowed me to publish the color picture, and to describe the specimens he collected inside a fungus growing ant nest. Jacques C.H. Delabie, Jack Longino and Fernando Fernandéz provided several specimens for this study, and information regarding their biology. Lara Maria Guimarães (MZSP) took the SEM pictures. Alexandre P. Aguiar, Ted Schultz, and an anonymous reviewer read earlier versions of the manuscript and suggested several improvements to the text.

REFERENCES

Adams, R.C., Mueller, U.G. & Schultz, T.R. 1998-1999. Nest usurpation and fungivory in *Megalomyrmex* sp. nov. (*Silvestrii* species group): lestobiotic or predatory relations with fungus-growing ants? In: Schwarz, M.P. & Hogendoorn (eds.) Insects at the turn of the Millennium, International Congress of IUSSI, 14º. *Proceedings.* Adelaide, Australia, IUSSI. p.75.

Adams, R.C.; Mueller, U.G.; Schultz, T.R. & Norden, B. 2000. Agro-predation: usurpation of attine gardens by *Megalomyrmex* ants. *Naturwissenschaften*, 87:549-554.

Brandão, C.R.F. 1990. Systematic revision of the Neotropical ant genus *Megalomyrmex* Forel (Hymenoptera: Formicidae: Myrmicinae), with the description of thirteen new species. *Arquivos de Zoologia,* 31(5):411-481.

Brandão, C.R.F. 2000. Major regional and type collections of ants (Formicidae) of the world and sources for the identification of ant species. In: Agosti, D.; Majer, J.D.; Alonso, L.E. & Schultz, T.R. (eds) *Ants. Standard methods for measuring and monitoring biodiversity*. Washington, Smithsonian Univ. Press, xix + 280p.

Brandão, C.R.F., Diniz, J.L.M., Agosti, D. & Delabie, J. 1999. Revision of the Neotropical ant subfamily Leptanilloidinae. *Systematic Entomology,* 24:17-36.

Emery, C. 1890. Studi sulle formiche della fauna neotropica. I-V. *Bolletino de la Societá Entomologica Italiana,* 22:38-80.

Emery, C. 1896. Studi sulle formiche della fauna neotropica. XVII-XXV. *Bolletino de la Societá Entomologica Italiana,* 28:33-107.

Escobar, F. & Valderrama, C. 1995. Comparación de la Biodiversidad de Artrópodos de Bosque a través del Gradiente Altitudinal Tumaco – Volcán Chiles (Nariño): Evaluación del efecto de la deforestación. *Informe FEN & Fundación MacArthur*, Septiembre de 1995.

Fernández-C., F. & Baena-H, M.L. 1997. Hormigas de Colombia VII: nuevas especies de los generos *Lachnomyrmex* Wheeler y *Megalomyrmex* Forel (Hymenoptera: Formicidae). *Caldasia,* 19(1-2):109-114.

Forel, A. 1899. Formicidae. In: *Biologia Centrali Americana. Hymenoptera.* London, v.3, 160p.

Forel, A. 1911. Ameisen des Herrn Prof. v. Jhering aus Brasilien (São Paulo usw.) nebst einigen anderen aus Südamerika und Afrika. *Deutsche Entomologische Zeitschrift,* 1911:285-312.

Forel, A. 1912. Formicides néotropiques. Part IV. 3me sous-famille Myrmicinae Lep. (suite). *Mémoires de la Société Entomologique de Belgique,* 20:1-32.

Hölldobler, B. & Wilson, E.O. 1990. *The Ants*. Cambridge, Harvard Univ. Press. 732p.

Jones, T.H., Wojciechowski, T.J., Snelling, R.R., Torres, J.A., Chacón, P. & DeVries, P.J. 1999. Dialkylpyrrolidines from the ants

Megalomyrmex cyendyra Brandão and *M. latreille* Emery. *Caribbean Journal of Science,* 35(3-4):310-311.

Kempf, W.W. 1961. A survey of the ants of the soil fauna in Surinam (Hymenoptera: Formicidae). *Stud. Entom.* 4:481-524.

Mann, W.M. 1916. The Stanford Expedition to Brazil, 1911, John C. Branner, Director. The ants of Brazil. *Bulletin of Museum Comparative Zoology,* Harvard, 60:399-490.

NIS Gazetteer, 1955-1974. Washington, U. S. Board on Geographical Names.

Soares, S.M., Marinho, C.G.S. & Della Lucia, T.M. 1998. Riqueza de espécies de formigas edáficas em plantação de eucalipto e em mata secundária nativa. *Revista brasileira de Zoologia*, 15(4):889-898.

Tavares, A.T. 2002. *Estimativas da diversidade de formigas (Hymenoptera: Formicidae) de serapilheira em quatro remanescentes de floresta ombrófila densa e uma restinga no Estado de São Paulo*. Ribeirão Preto, Faculdade de Filosofia, Ciências e Letras, USP. 147p. (Unpublished Ph. D. thesis)

Wheeler, W.M. 1909. Ants collected by Prof. Filippo Silvestri in Mexico. *Bolletino dei Laboratórii di Zoologia, Portici,* 3:228-238.

Wheeler, W.M. 1925. Neotropical ants in the collection of the Royal Museum of Stockholm. *Arkiv fur Zoologie,* 17A(8):1-55.

Wilson, E.O. 1987. The Arboreal Ant Fauna of Peruvian Amazon Forests: A First Assessment. *Biotropica,* 19(3):245-251.

Yamamoto, C.I. 1999. *Fauna de formigas (Hymenoptera, Formicidae) de serapilheira de Mata Atlântica – levantamento quantitativo na Estação Biológica de Boracéia (Salesópolis, SP, Brasil)*. São Paulo, Departamento de Zoologia, IB, USP, 95p. (Unpublished MS. Thesis)

Recebido em: 30.01.2003
Aceito em: 01.09.2003

FAPESP
Publicado com o apoio financeiro da Fundação de Amparo à Pesquisa do Estado de São Paulo

Seção de Publicações do Museu de Zoologia da Universidade de São Paulo

EDITORIAL COMMITTEE

Editor-in-Chief: Hussam Zaher, Serviço de Vertebrados, Museu de Zoologia, Universidade de São Paulo, Caixa Postal 42.494, CEP 04218-970, São Paulo, SP, Brasil. E mail: hzaher@ib.usp.br.

Associate Editors: Antonio C. Marques (Universidade de São Paulo, Brasil), Mario C.C. de Pinna (Universidade de São Paulo, Brasil), Sergio A. Vanin (Universidade de São Paulo, Brasil).

Editorial Board: Aziz N. Ab'Saber (Universidade de São Paulo, Brasil), Rudiger Bieler (Field Museum of Natural History, U.S.A.), Walter A.P. Boeger (Universidade Federal do Paraná, Brasil), Carlos Roberto F. Brandão, (Universidade de São Paulo, Brasil), James Carpenter (American Museum of Natural History, U.S.A.), Ricardo Macedo Correa e Castro (Universidade de São Paulo, Brasil), Darrel Frost (American Museum of Natural History, U.S.A.), W.R. Heyer (National Museum of Natural History, U.S.A.), Ralf Holzentahl (University of Minesotta, U.S.A.), Adriano Kury (Museu Nacional do Rio de Janeiro, Brasil), Gerardo Lamas (Museu Javier Prado de Lima, Peru), John Maisey (American Museum of Natural History, U.S.A.), Ubirajara Martins (Universidade de São Paulo, Brasil), Naércio Menezes (Universidade de São Paulo, Brasil), Christian de Muizon (Museum National d'Histoire Naturelle, France), Nelson Papavero (Universidade de São Paulo, Brasil), James Patton (University of Berkeley, U.S.A.), Richard Prum (University of Kansas, U.S.A.), Marcos Raposo (Museu Nacional do Rio de Janeiro, Brasil), Olivier Rieppel (Field Museum of Natural History, U.S.A.), Miguel T.U. Rodrigues (Universidade de São Paulo, Brasil), Randahl Schuh (American Museum of Natural History, U.S.A.), Marcos Tavares (Universidade de São Paulo, Brasil), Paulo E. Vanzolini (Universidade de São Paulo, Brasil), Richard Vari (National Museum of Natural History, U.S.A.), Mario de Vivo (Universidade de São Paulo, Brasil) and Paulo Young (Museu Nacional do Rio de Janeiro, Brasil).

INSTRUCTIONS TO AUTHORS
(MAY 2002)

General Information: *Papéis Avulsos de Zoologia* covers primarily the fields of Zoology, publishing original contributions in systematics, paleontology, evolutionary biology, ecology, taxonomy, anatomy, behavior, functional morphology, molecular biology, ontogeny, faunistic studies, and biogeography. *Papéis Avulsos de Zoologia* also encourages submission of theoretical and empirical studies that explore principles and methods of systematics.

All contributions must follow the International Code of Zoological Nomenclature. Relevant specimens should be properly curated and deposited in a recognized public or private, non-profit institution. Tissue samples should be referred to their voucher specimens and all nucleotide sequence data (aligned as well as unaligned) should be submitted to GenBank (http://www.ncbi.nih.gov/Genbank/) or EMBL (http://www.ebi.ac.uk/).

Peer Review: All submissions to *Papéis Avulsos de Zoologia* are subject to review by at least two referees and the Editor-in-Chief. Three legible copies (including photocopies of original illustrations) and original illustrations must be submitted; all authors will be notified of submission date. Authors may suggest potential reviewers. Communications regarding acceptance or rejection of manuscripts are made through correspondence with the first or corresponding author only. Once a manuscript is accepted providing changes suggested by the referees, the author is requested to return a revised version incorporating those changes (or a detailed explanation of why reviewer's suggestions were not followed) within four weeks upon receiving the communication by the editor. Revised manuscripts must be submitted as both hard copy and electronic file (3.5" disk, Zip Drive, or CD Rom with text in Microsoft Word format). Figures and graphics should be sent separately (".jpg", ".tif", ".xls", ".cdr").

Proofs: Page-proofs with the revised version will be sent to the first or corresponding author. Page-proofs *must be returned to the editor in two weeks, preferentially within 48 hours*. Failure to return the proof promptly may be interpreted as approval with no changes and/or may delay publication. Only necessary corrections in proof will be permitted. Once page proof is sent to the author, further alterations and/or significant additions of text are permitted only at the author's expense or in the form of a brief appendix ("note added in proof").

Submission of Manuscripts: Manuscripts should be sent to the Editor-in-Chief (H. Zaher, Museu de Zoologia da USP, Caixa Postal 42.494, CEP 04218-970, São Paulo, SP, Brasil). Manuscripts are considered on the understanding that they have not been published or will not appear elsewhere in substantially the same or abbreviated form. The criteria for acceptance of articles are: quality and relevance of research, clarity of text, and compliance with the guidelines for manuscript preparation.

Manuscripts should be written preferentially in English, but texts in Portuguese or Spanish will also be considered. Studies with a broad coverage are encouraged to be submitted in English. All manuscripts should include an abstract in Portuguese **and** English regardless of the original language.

Authors are requested to pay attention to the instructions concerning the preparation of the manuscripts. Close adherence to the guidelines will expedite processing of the manuscript, whereas manuscripts deviating from the required form will be returned for revision prior to review.

Manuscript Form: Manuscripts should not exceed 100 pages of double-spaced typescript on 21 by 29.7 cm (A4 format) or 21.5 by 28 cm (letter format) paper, with wide margins. The pages of the manuscript should be numbered consecutively.

The text of articles should be arranged in the following order: Title Page, Abstracts, Body of Text, Literature Cited, Tables, Appendices, and Figure Captions. Each of these sections should begin on a new page. All typescript pages must be double-spaced.

(1) ***Title Page:*** This should include the title, author(s) name(s), institutions, and keywords in English as well as in the language of the manuscript, and a short running title in the language of the manuscript. The title should be concise and, where appropriate, should include mention of families and/or higher taxa. Names of new taxa should not be included in titles.

(2) ***Abstract:*** All papers should have an abstract in English and another in Portuguese, regardless of the original language. The abstract is of great importance as it may be reproduced elsewhere. It should be in a form intelligible if published alone and should summarize the main facts, ideas, and conclusions of the article. Telegraphic abstracts are strongly discouraged. Include all new taxonomic names for referencing purposes. Abbreviations should be avoided. It should not include references. Abstracts should not exceed 350 words.

(3) ***Body of Text:*** The main body of the text should include the following sections: Introduction, Materials and Methods, Results, Discussion, and Acknowledgments at end. Primary headings in the text should be in capital letters and centered; the following text should begin on the next line, indented. Secondary headings should be in capital and lowercase letters and flush left; the following text should begin on the next line, indented. Tertiary headings should be in capital and lower case letters, in italics and indented; the following text should be on the same line and separated from the heading by a hyphen.

(4) ***Literature Cited:*** Citations in the text should be given as: Silva (1998)..., Silva (1998:14-20)..., Silva (1998: figs. 1, 2)..., Silva (1998a, b)..., Silva & Oliveira (1998)..., (Silva, 1998)..., (Rangel, 1890; Silva & Oliveira, 1998a, b; Adams, 2000)..., (Silva, pers. comm.)..., (Silva *et al.*, 1998), the latter when the paper has three or more authors. The reference need not be cited when author and date are given only as authority for a taxonomic name. The literature section should be arranged strictly alphabetically and given in the following format:

Journal Article – Silva, H.R.; Oliveira, H. & Rangel, S. Year. Article title. Journal name, 00:000-000. Names of journals must be spelled out in full.

Books – Silva, H.R. Year. Book title. Publisher, Place, 000p.

Articles in Books – Silva, H.R. Year. Article title. In: Oliveira, H. & Rangel, S. (Eds.), Book title. Publisher, Place. p.000-000.

Articles in Larger Works – Silva, H.R. Year. Article title. In: H. Oliveira & S. Rangel (Eds.), Title of Larger Work. Serial Publication. Publisher, Place. pp.000-000.

Dissertations and Theses – Silva, H.R. Year. Dissertation title. Ph.D. dissertation, University, Place, 000p.

Tables: All tables must be numbered in the same sequence in which they appear in the text. Authors are encouraged to indicate where the tables should be placed in the text. They should be comprehensible without reference to the text. Tables should be formatted with horizontal, not vertical, rules. In the text, tables should be referred as Table 1, Tables 2 and 3, Tables 2-6. Use "TABLE" in the table heading.

Illustrations: Figures should be numbered consecutively, in the same sequence they appear in the text. Separate illustrations of a composite figure should be identified by capital letters and referred in the text as so (fig. 1A). Where possible, letters should be placed in the lower right corner of each illustration of a composite figure. Hand-written lettering on illustrations is unacceptable. Illustrations should be mounted on stout, white cardboard. Figures should be mounted in order to minimize blank areas between separate illustrations. High quality color or black and white photographs, and computer generated figures are preferable. Authors are encouraged to indicate where the figures should be placed in the text. Use "(Fig(s).)" and "Figure(s)" for referring to figures in the text, but "FIGURE(S)" in the figure captions and "(fig(s).)" when referring to figures in another paper.

For other details of manuscript preparation of format, consult the CBE Style Manual, available from the Council of Science Editors (http://www.councilscienceeditors.org/publications/style.cfm).

Papéis Avulsos de Zoologia and Arquivos de Zoologia are publications of the Museu de Zoologia da Universidade de São Paulo (www.mz.usp.br).